DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: **MacDermid Incorporated**
Facility Address: **526 Huntingdon Avenue, Waterbury, Connecticut**
Facility EPA ID #: **CTD001164599**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X*__ If yes - check here and continue with #2 below.
_____ If no - re-evaluate existing data, or
_____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

*Note: **According to a February 11, 2002 correspondence from the United States Environmental Protection Agency (EPA), groundwater monitoring was reportedly performed in 8/87, 1/88, 10/88, 10/92, 2/93 and twice in 1/94; however, this data was not available for review and was not used in development of this EID.**

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., Site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			1,1,-DCA, 1,1,-DCE, PCE, TCE, Cu, and Zn exceeded one or more of the following regulatory criteria: EPA Maximum Contaminant Levels and Surface Water Protection Criteria (SWPC) as tabulated in the Connecticut Department of Environmental Protection (CT DEP)Remediation Standard Regulations (RSR).
Air (indoors)[2]		X		Operations have ceased and there is no intent to resume operations at this facility, the absence of workers at this facility eliminates a complete exposure pathway for indoor air, as long as the building remains vacant. In addition, contaminant concentrations in the most recent groundwater sampling event did not exceed the revised industrial/commercial VC. Also, the direction of groundwater flow to the southeast precludes contaminated groundwater at the Site from potentially impacting abutting residential properties located to the north and west of the Site.
Surface Soil (e.g., <2 ft)		X		No exceedances of the Residential Direct Exposure Criteria (RDEC) per the RSRs were observed for the surface soil samples collected at the Site.
Surface Water		X		PCE was detected in groundwater beneath the Site at concentrations that exceeded the respective SWPC. An alternative SWPC was calculated. PCE concentrations did not exceed the alternative SWPC. Groundwater beneath the Site discharges to the Naugatuck River.
Sediment	X			Sediment in Steele Brook is reasonably expected to be impacted with Cu as a result of a release of copper etchant to a stormwater system in 1994, but inaccessibility makes this water body an incomplete pathway. PCE was detected in groundwater beneath the Site in a groundwater sample collected from one downgradient monitoring well. An alternative SWPC was calculated. PCE concentrations did not exceed the alternative SWPC. Groundwater beneath the Site discharges to the Naugatuck River.
Subsurf. Soil (e.g., >2 ft)	X			Though subsurface soil at portions of the Site is reasonably expected to be contaminated, exposure to subsurface soil is controlled through the Project Activity Analysis (PAA), an institutional control, to ensure analytical data for subsurface soils are reviewed or generated/evaluated prior to exposure.
Air (outdoors)	X			Exposure to outdoor air (trench air) is considered applicable to Excavation Laborers. As the subsurface soil at portions of the Site is reasonably expected to be contaminated, it is similarly reasonably expected that excavation laborers may be exposed to contaminated air during performance of excavations. The exposure to air by excavation laborers is limited through the implementation of an institutional control, the PAA, to ensure analytical data for subsurface soils and/or groundwater are reviewed or generated/evaluated prior to exposure.

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

_X_ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and References:

The Site is located at 526 Huntingdon Avenue in Waterbury, Connecticut (Figure 1 in Attachment 1) and includes two parcels of land (i.e. the SOUTH parcel and the NORTH parcel). The first parcel is located on the southern side of Huntingdon Avenue and encompasses approximately 11 acres. For the purposes of clarity in this document, the 11-acre parcel will be referred to as the SOUTH parcel (Drawing 1 in Attachment 2). The SOUTH parcel is improved with three interconnected buildings having a total footprint of approximately 182,500 square feet. These buildings are referred to as the Gear Street Building, East Aurora Street Building, and the Huntingdon Avenue Building. There is little topographic relief on the SOUTH portion of the Site, which lies at approximately 300 feet above mean sea level (MSL). The Site is located approximately 1,000 feet northwest of the Naugatuck River, which lies at approximately 260 feet above MSL. The Site and immediately surrounding area are zoned for industrial use.

The second parcel is located on the northern side of Huntingdon Avenue, and encompasses approximately 30 acres. For the purpose of clarity in this document, the 30-acre parcel will be referred to as the NORTH parcel (Drawing 2 in Attachment 2). The NORTH parcel is primarily covered with grass and other native vegetation. Two paved areas are located on the southern and southeastern portions of the NORTH parcel. The first paved area is located immediately along the north side of Huntingdon Avenue and was used for parking by employees of the MacDermid facility located on the southern side of Huntingdon Avenue. The second paved area, located approximately 400 feet north of Huntingdon Avenue, serves as an asphalt cap to a sludge disposal area. Historical information pertaining to the sludge disposal area is presented in a subsequent portion of this section.

The MacDermid facility was primarily engaged in blending and/or compounding chemical materials used in the metal finishing, plating on plastics and printed circuit industries. In particular, MacDermid manufactured inks and electroless nickel plating solutions for these industries. The Standard Industrial Classification (SIC) Code for the facility is 2899. Ancillary activities conducted by MacDermid at the facility included reprocessing copper etchant solution received in bulk from their customers or off-site MacDermid facilities.

In order to determine a general history of the Site, Sanborn Fire Insurance Maps and aerial photographs pertaining to the Site were reviewed. The Sanborn Fire Insurance Maps obtained from the Connecticut State Library archives indicated that the Waterbury Steel Ball Company occupied the Gear Street Building and the Carroll Wire Company occupied the Huntingdon Avenue Building in 1921. Mapping prior to 1921 was not available. Also, the Sanborn Map indicated that MacDermid occupied the Huntingdon Avenue Facility in 1930. Aerial photographs of the Site obtained from the DEP depict a drum storage area of approximately 30 drums behind a shed outside the Huntingdon Avenue Building in the 1965 photograph that did not appear in the 1970 photograph. Aerial photographs also indicate a lagoon was added between 1970 and 1975 west of the Huntingdon Avenue Building near Huntingdon Avenue. This lagoon and a second adjacent lagoon were used for disposal of organic and inorganic process waste generated at the facility by MacDermid. The lagoons were removed between approximately 1980 and 1986 and the East Aurora Street Building was constructed such that the Huntingdon Avenue Building was connected to the Gear Street Building. The Site remained generally unchanged from 1986 to 2002.

According to historical environmental investigation reports, between 1978 and 1979, approximately 1,000-cubic yards of metal hydroxide sludge was removed from the aforementioned waste lagoons and disposed of in an excavated area on the southeastern portion of the MacDermid NORTH parcel located on the northern side of

Huntingdon Avenue. In addition to metal hydroxide sludge, potentially-contaminated soil from the same waste lagoons from the SOUTH parcel was reportedly also disposed of in the same excavated area. Prior to emplacement on the MacDermid NORTH parcel, the waste materials were mixed with Site sand and gravel to increase load-bearing characteristics. In 1986, the material was covered with approximately nine inches of processed aggregate and three inches of asphalt. MacDermid personnel indicated that the information contained in the historical environmental investigation reports regarding the disposal of sludge was incorrect. Instead, MacDermid personnel assert that the metal hydroxide sludge was not disposed of on the NORTH parcel, but rather off-site at a licensed disposal facility. Further, MacDermid states that this area was used only for the disposal and subsequent capping of potentially-contaminated soil from the SOUTH parcel waste lagoons.

In 2002, manufacturing activities at the facility ceased. At the time of this submittal, operations at the facility have ceased, the buildings are unoccupied, and the routine inspection of short duration will be the extent of worker activity at the Site.

A report entitled *Conceptual Site Model (CSM) and Screening Levels, MacDermid Incorporated* was prepared in May 2002 by LEA. EPA comments to the CSM were addressed in the cover letter included with the November 2002 environmental indicator determination submittal. The CSM provides a description of exposure media and exposure pathways, a description of potential receptors, a rationale and approach to screening analytical data generated for exposure media, and screening levels for exposure media. For the facility, the model also identifies the applicable receptors, exposure media and pathways that require screening as shown on Drawings 1, 2, and 5 in Attachment 2 and depicted graphically on Figure 2 in Attachment 1. Since submittal of the CSM in May 2002 and MacDermid's response to EPA comments in November 2002, activities at the Site have changed and additional evaluation of receptors, exposure pathways, and media has been completed. Based on the additional evaluations, an updated summary of the receptors, exposure pathways and media include:

On-Site Receptors

<u>On-Site Workers</u>

- Excavating laborers: Surficial and subsurface soils by ingestion and dermal contact, inhalation of trench air.
- Groundskeepers: Surface soil by ingestion and dermal contact.
- Indoor workers: Indoor air inhalation.
- Environmental samplers: Ingestion and dermal contact with surficial and subsurface soils and groundwater; Ingestion and dermal contact with light non-aqueous phase liquid (LNAPL)
- Trespassers: Surface soil by ingestion and dermal contact.

Off-Site Receptors

Off-Site Workers

- Utility Repair Workers: Ingestion and dermal contact with surficial and subsurface soils and inhalation of trench air. However, any contamination present in shallow off-site soils would not be the result of MacDermid activities because shallow soil contamination typically occurs when a release of contaminants has occurred. There is no documentation of an off-site release to soil associated with MacDermid activities.

- Residents: Indoor air inhalation.

- Recreators: Ingestion and dermal contact with surface water and sediment in the Naugatuck River and Steele Brook that is contaminated by groundwater discharging from the Site.

- Indoor Workers: Indoor air inhalation.

Figure 2 of the CSM, as provided in Attachment 2 reflects the above noted updates to receptors, exposure pathways, and media. This documentation of environmental indicator determination is based on a review of all available relevant/significant data as it applies to these receptors for the identified exposure media and pathways. Notably, according to a February 11, 2002 correspondence from the United States Environmental Protection Agency (EPA), groundwater monitoring was performed August 1987, January 1988, October 1988, October 1992, February 1993 and twice in January 1994; data from these events were not available for review and were not used in development of this EID.

Groundwater

Through 2001, monitoring wells MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, MW-107, MW-108, MW-109, MW-110, MW-111, MW-112, and MW-113 were installed at the Site by prior environmental consultants. On-site monitoring wells MW-114, MW-115, and nested monitoring wells MW-116S and MW-116D were installed by LEA in August 2002 and September 2003. Drawings 1 and 2 in Attachment 2 depict all the monitoring well locations. Monitoring well completion reports and geologic boring logs for the wells installed by LEA in August 2002 and September 2003 are provided in Attachments 3 and 4, respectively. In response to a request from the EPA, documented in the April 9, 2004 EPA Comments to the Documentation of Environmental Indicator (CA725), a report entitled *Additional Investigations Work Plan and Quality Assurance Project Plan for Documentation of Environmental Indicator Determination (CA725) Current Human Exposures Under Control, MacDermid, Incorporated, Waterbury, CT* (Work Plan) was prepared by LEA on behalf of MacDermid, Incorporated and submitted to the EPA on June 24, 2004. The subsurface investigations proposed in the Work Plan included the installation of four piezometers for the measurement of water levels, four groundwater monitoring wells installed in two clusters (with each cluster composed of a shallow and a deep well), the collection of one round of groundwater sampling from all existing and newly installed monitoring wells at the Site, and measurement of water levels existing and newly installed monitoring wells and piezometers. The additional subsurface investigations were completed in August 2004.

Two locations along the western Site boundary (along Gear Street) were selected for the installation of the two sets of cluster wells, identified as MW117S/MW-117D and MW-118S/MW-118D (Drawing 1 in Attachment 2). Three previously existing groundwater monitoring wells, MW-104, MW-106, and MW-107, had either been destroyed or damaged and one monitoring well, MW-108, was found to contain separate-phase product, such as petroleum product. As the locations of these monitoring wells were considered important for developing a representative groundwater contour map, it was determined that piezometers would be placed in the vicinity of these monitoring wells, and water levels from these locations would be utilized in calculating the groundwater flow across the Site. Piezometers PZ-01, PZ-02, PZ-03, and PZ-04 were advanced either upgradient or sidegradient of monitoring wells MW-104, MW-106, MW-107, and MW-108, respectively (Drawing 1 in Attachment 2). These piezometers were constructed similarly to permanent groundwater monitoring wells.

A report entitled *Technical Memorandum, Additional Subsurface Investigations, August 2004, MacDermid, 526 Huntingdon Avenue, Waterbury, CT* (Technical Memorandum) was prepared by LEA to document the August 2004 additional investigation activities and results. A copy of this report is provided in Attachment 5. The Technical Memorandum describes in further detail the monitoring well and piezometer installation methodology, the groundwater sample collection activities, and the groundwater sample analytical laboratory results. The Work Plan is provided in Exhibit A of the Technical Memorandum (Attachment 5). Field documentation, well completion reports, and geologic boring logs associated with the August 2004 additional investigations are provided in Exhibits C, D, and F of the Technical Memorandum.

Site geology has been evaluated during the course of investigation activities completed at the Site by LEA and others. Geologic conditions encountered at the Site are variable. The unconsolidated vadose zone sediments beneath the Site range from grey brown and brown, fine to coarse sand with traces of gravel; a fill layer consisting of medium to coarse sand and building debris was identified in some boring locations to depths of approximately five feet below grade; to heterogeneous glacial outwash material (sub-rounded cobbles, gravels, and coarse-grained sand). These vadose zone deposits overlie a very uniform deposit of fine to very fine sand and silt that was encountered at a depth of approximately 17 to 60 feet below ground surface (bgs). The water table was encountered at depths of approximately 30 feet bgs within the very fine sand and silt stratum.

With the installation of two groundwater monitoring wells along the southeastern Site boundary in August 2002, one shallow and one deep monitoring well to the southwestern Site boundary in September 2003, two cluster monitoring wells and four piezometers in August 2004, and the existing monitoring wells, the groundwater monitoring well network at the Site is determined to be adequate in number and spatial distribution to assess the quality and flow direction of groundwater at the Site. A synoptic water-level measurement event and well survey was completed on all existing and newly installed monitoring wells and piezometers in August 2004, as described in the Work Plan (Exhibit 1 of the Technical Memorandum provided in Attachment 5). During the water-level measurement event, separate-phase product was observed in monitoring well MW-108 and piezometer PZ-04 above the groundwater table, indicating a light non-aqueous phase liquid (LNAPL) characteristic of a petroleum product. The thickness of product in monitoring well MW-108 was measured at 0.67 feet. The product thickness in piezometer PZ-04 was measured at 3.99 feet. Water levels measured in each of the wells during the water-level measurement event are provided on Table 4 of Exhibit E of the Technical Memorandum (Attachment 5).

During the well survey activities completed in August 2004 for all the existing monitoring wells and piezometers, the use of a magnetic locator was employed to locate monitoring well MW-103, which was found beneath heavy foliage and subsequently included as part of the well survey activities. Water-level measurements were obtained from all existing wells and piezometers.

Based on the well survey and water-level measurements completed in August 2004, a more accurate and refined groundwater contour map was developed. The calculated groundwater contours indicate that groundwater flow across the Site trends in a southeasterly towards the Naugatuck River. The groundwater contours associated with the August 2004 well survey and water-level measurements are illustrated on Drawing 3 – Groundwater Contour Map August 17, 2004, provided in Attachment 2.

Groundwater samples were collected from existing and newly installed monitoring wells (i.e., MW-101, MW-102, MW-103, MW-105, MW-109, MW-110, MW-111, MW-112, MW-113, MW-114, MW-115, MW-116S, MW-116D, MW117S, MW-117D, MW-118S, MW-118D) on August 12, 13, and 16, 2004 for laboratory analysis of volatile organic compounds (VOCs), cyanide, and RCRA 8 metals plus copper, nickel, and zinc. Tables 1 through 3 in Exhibit E of the Technical Memorandum summarize the analytical and sampling data for constituents detected in the August 2004 groundwater sample event. Analytical laboratory reports for the August 2004 groundwater sampling event are provided in Exhibit G of the Technical Memorandum (Attachment 5).

To address potential exposures to Environmental Samplers from ingestion and dermal contact with groundwater while collecting samples at the Site, the groundwater data collected from the Site in August 2004 were compared to the Federal Maximum Contaminant Levels (MCLs). Exceedances of the MCLs identified for the most recent sampling round include chromium, nickel, 1,1-dichloroethylene (1,1,-DCE), 1,2-dichloroethane (1,2-DCA), tetrachloroethylene (PCE), and trichloroethylene (TCE) in monitoring well MW-115. PCE concentrations exceeded the MCLs in monitoring wells MW-105, MW-109, and MW-110. With the exception of monitoring well MW-115, no other downgradient monitoring wells of MW-105, MW-109, and MW-110 exhibited constituents at concentrations that exceeded the MCLs. Concentrations of all other constituents were similar or less than previously detected in wells during the 2001, 2002, and 2003 sampling events. This includes cadmium, which exceeded the MCLs in prior sampling events, but not the most recent groundwater sampling event. A decrease in concentrations, particularly metals, may be due to the use of modified low-flow groundwater sampling techniques utilized during the August 2004 groundwater sample collection event, versus the use of bailers in the 2002 and 2003 groundwater sample events.

The presence of LNAPL has been documented in monitoring well MW-108 and piezometer PZ-04. Exposure to this medium is controlled through an institutional control at the Huntingdon Avenue facility. This institutional control is described in further detail in greater detail in response to Question 3.

Table 1, provided in Attachment 6, provides a summary of sampling and analytical information for the groundwater sampling events completed between 1995 and 2004. Table 2, provided in Attachment 6, includes a summary of exceedances of the MCLs for groundwater collected at the Site. Analytical laboratory reports for the 2002 and 2003 groundwater sampling events are provided in Attachment 7.

Per the Work Plan, additional research and evaluations to address the presence of downgradient industrial groundwater supply wells were completed to verify if the wells are still in use (despite public water supply connections) and if the use of the groundwater poses a health risk. In February 2001, HRP Associates, Inc. completed a report entitled *Well Receptor Survey, MacDermid, Inc., 526 Huntingdon Avenue, Waterbury, Connecticut (*2001 Well Receptor Survey*)*, which was included in the January 2004 EI, and is provided in Attachment 8. This 2001 Well Receptor Survey was conducted to identify public and private water supply sources (potential receptors) in what was deemed to be downgradient and sidegradient areas of the Site. The extent of the 2001 Well Receptor Survey encompassed the area within: 1,400 feet to the south (Steele Brook and Naugatuck River); 1,000 feet to the northeast (Route 8); 700 feet to the east (Naugatuck River); and, 1,000 feet to the west (Steele Brook). Five water supply wells and four industrial water supply wells were identified, but the operational status of these wells was not defined. These wells are described in the 2001 Well Receptor Survey as follows:

- Wells 12 and 12A located at 526 Huntingdon Avenue (formerly Waterbury Steel Ball Co.) were completed in 1925 and 1947, respectively. Well 12 was listed as currently unused and well 12A was listed as being a well used to withdraw water for air conditioning.

- Wells 341, 341A, and 341B located at 237 E. Aurora Street, LEA Manufacturing Company, were completed in 1957, 1966, and 1967, respectively. Well 341 was listed as currently unused, and wells 341A and 341B were listed as used for industrial purposes.

- Well 343, located at 000 East Aurora Street (formerly Brock-Hall Dairy Company), was completed as a well used to withdraw water in 1945 for air conditioning purposes.

In July 2004, LEA completed a more extensive well survey that attempted to identify the current use of the public/industrial wells identified in the 2001 Well Receptor Survey. The first step in identifying the current use of these public/industrial water supply wells was the completion of a document search comprising well completion reports, well abandonment reports, and any analytical data records filed at the Waterbury Department of Public Health. According to Mr. Paul Vitterelli of the Environmental Health Division of the Waterbury Department of Public Health, no information regarding groundwater related issues was found in any documentation kept on file for Wells 12, 12A, 341, 341A, 341B, and 343, or 240 Huntingdon Avenue.

A further search was performed at the State of Connecticut Department of Public Health (DPH). Mr. Raymond Jermana of the DPH informed LEA personnel on July 15, 2004 that private well records were not typically kept on file at DPH and indicated that the local city health department should be contacted for such information. Mr. Jermana did indicate that potable water supply well information was kept on file at DPH, Drinking Water Division. LEA personnel contacted the DPH Drinking Water Division on July 15, 2004 and was informed that, as part of the DPH Drinking Water Division Source Water Assessment Program, water supplies utilized for potable water were tested at least annually by DPH. Such testing also involved backflow prevention inspections for well supplies at sites that are cross connected to a public water supply system.

According to the DPH website, the only community water supply system located in Waterbury is operated by the Waterbury Water Department. There were no transient non-community (TCN) water supplies located in Waterbury and only five non-transient, non-community (NTNC) water supplies located in Waterbury, but none near the Site. A TCN is defined by DPH as a water system which provides water to a facility, such as a gas station or campground, where use or residence by fewer than 25 people occurs over a short period of time. These systems do not have to test or treat their potable water supply for contaminants that pose long-term health risks because fewer than 25 people drink the water over a long period of time. A NTNC water system is defined by DPH as a water system which supplies potable water to 25 or more of the same people over a period of at least six months per year in non-residential facilities such as schools, factories, office buildings, and hospitals with private water supply systems.

The Waterbury Water Department was contacted on July 15, 2004. According to Mr. Tom Caviello of the Waterbury Water Department, any backflow prevention inspections performed by the Water Department are submitted to DPH. As such, any inspections on file at the Waterbury Water Department would also be on file at the DPH.

Subsequently, files were reviewed at the State Department of Environmental Protection (DEP) and United States Geologic Survey (USGS). P-5 inspection files and permit applications for discharges to surface water or the sanitary sewer were reviewed at the DEP for sites known to have industrial water supply wells. The DEP file reviews confirmed that a P-5 inspection report had previously been completed for the property located at 237 East

Aurora Street (LEA Manufacturing). In addition, a report entitled *Engineering Report on Modifications to Meet Acute Toxicity Limits at Waterbury Rolling Mills, Waterbury, CT*, prepared by Fuss & O'Neill and dated December 30, 1989, was reviewed at the DEP. The report contained a drawing, entitled "Water Flow Diagram – Sheet 1 of 2", that depicted a groundwater water supply well as a source for industrial use at the 240 Huntingdon Avenue (Rolling Mills Company) property.

A USGS file review did not reveal any new information, regarding Wells 12, 12A, 341, 341A, 341B, and 343, or the well located at 240 Huntingdon Avenue, Waterbury Rolling Mills. The only documentation found for these wells at the USGS is provided in the 2001 Well Receptor Survey.

Based on LEA's 2004 industrial/public well survey, it appears that the industrial supply wells at 237 East Aurora Street and 240 Huntingdon Avenue are used solely for industrial use. The water wells located at 526 Huntingdon Avenue, 420 Huntingdon Avenue, and at least a portion of 000 East Aurora Street are now owned by MacDermid. The industrial supply wells at the Site are not used for potable water supply. Therefore, the wells identified in the 2001 Well Survey do not appear to be used for potable water supply and as such, groundwater in these wells does not pose a health risk.

The potential for exposure to residents by indoor air impacted by volatile organic compounds in groundwater was indeterminate at the time of the submittal of the *Conceptual Site Model and Screening Levels, MacDermid Incorporated* in May 2002, due to the lack of data to verify groundwater flow direction, depth to groundwater, and potential for volatilization of contaminants from Site groundwater. Since that time, a pair of nested monitoring wells (MW-116S and MW-116D) was installed in September 2003, and two on-site cluster wells (MW-117S/MW-117D and MW-118S/MW-118D) were installed in August 2004. The nested and cluster wells were advanced along the Site boundary facing Huntingdon Place in order to determine the potential for off-site residents to the west of the Site to be exposed to contamination via indoor air inhalation. These wells were installed to span the water table (MW-116S, MW-117S, MW-118S) and at the bedrock surface (MW-116D, MW-117D, MW-118D). Groundwater contours were created from the data collected during the August 2004 groundwater sampling event. These contours show that groundwater beneath the Site flows to the southeast toward the Naugatuck River, and parallel to the residential properties (Drawing 3 in Attachment 2).

Groundwater samples collected from on-site monitoring wells in September 2003 and from monitoring wells MW-116S, MW-116D, MW-117S, MW-117D, MW-118S, and MW-118D in August 2004 were compared to the residential (VC) and the revised residential VC tabulated within the report entitled *Proposed Revisions, Connecticut's Remediation Standard Regulations, Volatilization Criteria,* prepared by the Permitting, Enforcement and Remediation Division, Bureau of Water Management, Connecticut Department of Environmental Protection, dated March 2003, and provided in Attachment 6. The CT DEP's proposed revised residential (VC) were promulgated to be more consistent with the EPA Draft Guidance *Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soil* that was issued in November 2002. In addition, the CT DEP's proposed revisions indicate that "the depth to groundwater in which these criteria (proposed) should be applied has been increased to 30 feet..."

In September 2003, vinyl chloride was present in monitoring well MW-116D at a concentration of 5.5 micrograms per liter (μg/l) which exceeded the current residential Volatilization Criteria (VC) of the Connecticut Department of Environmental Protection (CT DEP) Remediation Standard Regulations (RSRs). Exceedances of the current residential VC are provided in Table 3a of Attachment 6. The constituent 1,2-dichloroethylene was present in the groundwater samples collected from monitoring wells MW-111 and MW-115 at concentrations that minimally exceeded the proposed RVC. Depth to water at all the monitoring wells along the western boundary (MW-116S, MW-116D, MW-117S, MW-117D, MW-118S, and MW-118D) are greater than 30 feet below ground surface (Table 4 in Exhibit E of the Technical Memorandum) and as such, the VC would not apply. Table 3c in Attachment 6 identifies the VOC concentrations in groundwater samples collected in 2003 and 2004 that exceed the proposed residential VC.

Based on a review of groundwater analytical data collected in July 2002, September 2002, September 2003, and August 2004, the depth to water in monitoring wells MW-116S, MW-116D, MW-117S, MW-117D, MW-118S, and MW-118D at greater than 30 feet bgs, and groundwater flow across the Site in a southeasterly toward the Naugatuck River, it is concluded that contaminated groundwater at the Site does not have the potential to impact abutting residential properties to the southwest. Therefore, the exposure pathway between nearby residents and impacted indoor air from volatilization of contaminants is not considered complete and as such, groundwater does not pose a risk to human health.

There are several commercial facilities situated southeast of the Site, downgradient of flow direction. A comparison of the VOC concentrations in groundwater samples collected in 2003 and 2004 from downgradient monitoring wells along the south, southeastern and eastern monitoring wells (MW-111, MW-113, MW-114, and MW-115) was performed against the CT DEP's current and proposed revised industrial/commercial VC criteria (industrial/commercial VC were used fro comparison since there are no residential properties downgradient of the Site). The results of the comparison indicate there were no VOC concentrations that exceeded the proposed revised industrial/commercial VC. Although 1,1-DCE in monitoring well MW-115 does exceed the current industrial/commercial VC (Table 3b of Attachment 6) identified in the RSRs, the revised industrial/commercial VC is more representative of the EPA's guidance document and is considered to be applicable to this EI.

Although groundwater at the time of the most recent measurement of water levels is at depths greater than 30 feet bgs, changes to topography and/or changes in water level can bring groundwater depths to less than 30 feet. Groundwater discharging from the Site is considered a complete exposure pathway. However, VOC concentrations downgradient of the Site are below the revised industrial/commercial VC, and as such, do not pose a human health risk to off-site workers (receptors) in the commercial facilities situated along southeast (and south) of the Site.

Air (Indoor)

Volatilization of contaminants in groundwater is unlikely because depth to groundwater measurements indicate groundwater is approximately 30 feet below grade to 37 feet below grade as shown on Table 4 in the Technical Memorandum. The potential human pathway in this instance would involve volatilization of contaminants from impacted groundwater into the vadose zone, migration through the soil column into indoor air space and inhalation by the receptor. However, according to the EPA *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater to Soils*, exposure to volatile organic compounds from depths of 100 feet should be considered a potential pathway for air exposure.

Monitoring well MW-115 is located downgradient of one building structure at the Site (Drawing 1 in Attachment 2). As stated in the previous section, the VC are appropriately applied to groundwater at the Site at depths up to 30 feet below grade. Based on the locations of these wells and the EPA Guidance document, the potential for indoor air exposure from volatilization of these compounds in groundwater should be considered. However, MacDermid has substantially closed this facility and the building is vacant. Because operations have ceased and there is no intent to resume operations at this facility, the absence of workers at this facility eliminates a complete exposure pathway for indoor air, as long as the building remains vacant. In addition, contaminant concentrations in the most recent groundwater sampling event did not exceed the revised industrial/commercial VC. Also, the direction of groundwater flow to the southeast precludes contaminated groundwater at the Site from potentially impacting abutting residential properties located to the north and west of the Site, as discussed above.

Surface Soil

Four soil samples were collected from locations in exposed areas on the northwest and the southwest corners of the Site. These samples were collected at a depth of 0 to 0.5 feet below ground surface on July 30, 2002. The soil data obtained from this surface soil sampling conducted at the Site were compared to the Connecticut RSR Residential Direct Exposure Criteria (RDEC). Soil sampling conducted as part of the Voluntary Corrective Action Program (VCAP) was completed in areas where an exposure pathway exists (i.e. exposed soil, grass, and landscaped areas) and from areas possessing the greatest potential for impact, due to former active manufacturing operations (on the SOUTH parcel).

A consideration of activities conducted on the NORTH parcel was completed as part of the evaluation of potential contamination in Site surface soil. In particular, the use of a portion of the NORTH parcel for the disposal and subsequent capping of potentially-contaminated soil that emanated from metal hydroxide lagoons on the SOUTH parcel combined with the identification of drum disposal on the NORTH parcel were considered. During the period from 1978 to 1979, metal hydroxide sludge and soil from lagoons operated on the SOUTH parcel was excavated. Although conflicting information exists, MacDermid personnel have affirmed that only the soil removed from the lagoons was placed on the NORTH parcel; the sludge was shipped off-site for disposal. In 1986, the soil staging area on the NORTH parcel was capped in its entirety with a twelve-inch cover of processed aggregate (9-inches) and asphalt (3-inches). In 1981, metal hydroxide sludge material was sampled and analyzed for EP Toxicity (EPTOX) and in 1986, the potentially-contaminated soil excavated from the MacDermid property was sampled and analyzed for EPTOX. Silver was detected in the extract of two samples collected from potentially-contaminated soil collected from the sludge cell in 1986 at concentrations of 0.13 milligrams per liter (mg/l) and 0.14 mg/l. No other metals were detected in the two soil samples. EPTOX cadmium (0.02 mg/l to 0.04 mg/l) and chromium (0.19 mg/l to 0.24 mg/l) were detected in the extract of three composite sludge samples taken from drums at the MacDermid property located south of Huntingdon Avenue in 1981. No other metals were detected in the sludge samples collected for analysis.

Additionally, during relatively recent Site inspections of the NORTH parcel, two drums were identified in an upland area located north of the soil cap. Numerous other drums were also identified on what was thought to be the MacDermid-owned parcel; however subsequent survey data confirmed that only two of the drums were located on the MacDermid parcel. The drums that were identified on the NORTH parcel were found without covers, crushed, and free of content. MacDermid personnel confirmed that these empty drums were not placed on the NORTH parcel as a result of MacDermid activity, but rather were disposed of by others. Based on the as-found condition, upland location of the drums, and the remote, steep terrain conditions, it is unlikely that the drums could have been disposed of intact and containing material; therefore, soil sampling beneath the drums was deemed unnecessary and these areas are not considered to be a potential source of soil contamination.

The majority of the NORTH parcel has historically been vacant and undeveloped with the exception of a residence on the southernmost portion of the Site. MacDermid began using the 50 foot by 95 foot section of the NORTH parcel as the Former Disposal Area in 1978. The remainder of the NORTH parcel has remained undeveloped and unused by MacDermid. Because the only potential source of exposure from surficial soil on the NORTH parcel has been capped since 1986, there is not a risk of exposure from this area. Photographs of the condition of the bituminous asphalt covering the Soil Disposal Area and condition and location of the drums are included in Attachment 9.

The sample data set is adequate to assess the quality of surface soil in those areas likely to be encountered by Excavating Laborers, Groundskeepers, Environmental Samplers and Trespassers. Furthermore, that data set was collected from areas of the Site possessing the greatest potential to have been impacted by former Site manufacturing operations. No exceedances of the RDEC were noted for the surface soil samples collected at the Site. As such, the exposure pathway via ingestion and dermal contact between Excavating Laborers, Groundskeepers, Environmental Samplers, and Trespassers is considered incomplete. The locations of historic and recent soil sampling locations are depicted on Drawing 4 in Attachment 2. This drawing also provides a summary of analytical data collected for soil sampling conducted at the Site.

Surface Water

Two surface water bodies located near the Site, the Naugatuck River and Steele Brook are approximately 1,000 feet southeast and southwest of the Site, respectively. With the recent installation of overburden groundwater monitoring wells along the southwest portion of the Site, and piezometers, groundwater flow across the Site trends in a southeasterly direction towards the Naugatuck River. With the exception of a 1994 release of copper etchant to the storm drain system that discharges to Steele Brook, there is no potential for impact to Steele Brook. Following this release of copper etchant into the Steel Brook through the stormwater catchbasins, 30,000-gallons of water and etchant were removed from Steele Brook under the supervision of the CT DEP.

An evaluation was completed by the Connecticut DPH for the Chase Brass Copper Site, which is located approximately 1 mile upstream of the MacDermid site on the Naugatuck River, and summarized in a report entitled, Chase Brass and Copper Site, Waterbury, New Haven County, Connecticut, EPA Facility ID: CTD000856708, prepared by the Connecticut Department of Public Health, and dated March 7, 2002 (DPH Report). The DPH Report stated that "common eel, brown trout, fall fish, brook trout, dace and clams live in the river and fishing is popular in the area [of the Chase Brass Copper Site]." Furthermore, the DPH Report indicated that the Naugatuck River was used for fishing from the shoreline at the Chase Brass and Copper facility by trespassers.

To further assess whether a full survey of upgradient and downgradient sections of the waterbody have been conducted by MacDermid to determine accessibility, or whether the local health board or other agency has been contacted with regards to recreator use of the surface water bodies in the vicinity of the site, a detailed evaluation was completed. This evaluation encompassed a physical survey of the environment surrounding the Naugatuck River and interviews with applicable agencies.

The physical survey was completed along the stretch of the Naugatuck River from the point where Hancock Brook merges with the Naugatuck River to the West Main Street Bridge at Route 8 to determine the potential locations of accessible paths and docks, and the potential presence of recreators fishing or operating water crafts. This particular stretch of the Naugatuck River was chosen for the physical survey based on the determination that groundwater discharged from the Site to surface water along this area. Of immediate note was the infeasibility to access the Naugatuck River from the west bank due to the presence of a major interstate highway identified as Route 8. The topography of land between Route 8 and the west bank of the Naugatuck River is steeply sloped and heavily vegetated. Similarly, industrial and commercial development, heavy foliage, and lack of pathways along the eastern bank of the Naugatuck River provide extensive limitations for recreator access. In addition, it was observed that there did not appear to be any docks that could potentially be used by recreators to dock crafts or complete any recreational fishing activities. Photographic documentation of the Naugatuck River is provided in Attachment 9. However, that does not eliminate the potential for boaters to navigate through the stretch of the Naugatuck River from upgradient or downgradient areas not identified in the physical survey.

An interview was conducted with Mr. Bob Orciari, a fisheries biologist, with the Connecticut Department of Environmental Protection (DEP) Bureau of Natural Resources Fisheries Division on July 22, 2004. The interview incorporated queries as to recreator fishing and accessibility to the Naugatuck River along the stretch of the River mentioned above. Mr. Orciari confirmed that recreator fishing along the shoreline did occur along this stretch. In addition, there is only one access point along this stretch, located adjacent to the eastern bank of the Naugatuck River along Thomaston Avenue. Mr. Orciari also indicated that at one time in the past, Trout Unlimited hosted a small fishing gathering. Since that time, there haven't been any fishing tournaments or gathering hosted by associations or companies.

To further determine if groundwater that discharges to the surface water of the Naugatuck River may be contaminated from former Site operations, existing and newly installed monitoring wells were sampled for VOCs, cyanide, and RCRA 8 metals plus copper, nickel, and zinc in August 2004. A comparison of the August 2004 groundwater sample analytical laboratory results was performed against the Surface Water Protection Criteria (SWPC) tabulated in the CT DEP RSRs. It was determined that only one VOC constituent was detected in one downgradient monitoring well (based on groundwater flow direction) along the southeastern Site boundary that exceeded the SWPC. Tetrachloroethylene (PCE) was present in monitoring well MW-115 at a concentration of 280 micrograms per liter (μg/l). Table 4 in Attachment 6 identifies the constituent concentrations exceeding the default SWPC.

An alternative SWPC criterion was calculated for PCE in accordance with the methodology described in the RSRs using the human health criterion for "organisms only", as tabulated in Appendix D of the State of Connecticut Water Quality Standards. For PCE, the human health criterion for "organisms only" is 8.85 micrograms per liter (μg/l). According to the RSRs, an alternative, site-specific SWPC may be calculated for a site in order to determine whether groundwater discharging from a specific site has the potential to affect water quality in the surface water body to which such groundwater discharges. In this case, groundwater flowing beneath the Site discharges to the Naugatuck River, located approximately 1,000 feet southeast of the Site. Calculations to determine an alternative SWPC were performed in accordance with the methodology provided in Section 22a-133k-3 (b)(3)(A) of the RSRs. The 7Q10 for the Naugatuck River was obtained from the report entitled, *Total Maximum Daily Load Analysis for the Upper Naugatuck River, Thomaston, CT*', prepared by the Connecticut Department of Environmental Protection. The value of 12.6 cubic feet per second given in that report for the 7Q10 of the Naugatuck River at Thomaston, Connecticut, was actually a very conservative value in terms of the actual 7Q10 for the Naugatuck River in the vicinity of the MacDermid facility, since Thomaston is located a considerable distance upstream of Waterbury. Therefore, if the concentrations at the site are below the conservatively calculated alternative SWPC, there can be a high level of assurance that the groundwater discharging from the Site to the Naugatuck River will not result in a condition that would pose a risk to human health.

To further increase the conservative nature of the assessment of the potential risk associated with groundwater discharging from the Site to the Naugatuck River, the plume of groundwater exiting the Site exhibiting contamination due to the PCE was estimated conservatively to exhibit a width of approximately 970 feet along the southeastern property boundary. The more likely width of the plume for which elevated PCE concentrations (concentrations in excess of the tabulated SWPC identified in the RSRs) are believed to be present is closer to 280 feet.

According to *The Bedrock Geology of the Waterbury Quadrangle* published in 1967 by the State Geological and Natural History Survey of Connecticut and the depths at which refusal was reached at locations on the Site where deep monitoring wells were installed, the approximate depth to bedrock beneath the Site is 60 feet below grade. This was conservatively established as the lower bound of the plume of groundwater exiting the Site at a concentration of 280 μg/l. As the depth to groundwater below the Site is approximately 30 feet, an estimated thickness of contamination in groundwater below the site is 30 feet.

The volume of the plume discharging to the Naugatuck River (Q_{plume}) was calculated using the following data: the plume of groundwater exiting the Site exhibiting contamination due to the PCE was estimated conservatively to exhibit a width of approximately 970 feet along the southeastern property boundary multiplied by the an estimated saturated thickness of contamination in groundwater below the site of 30 feet (i.e. depth), which resulted in an area (A) over with the plume discharges to the river of 29,100 square feet.

The groundwater discharge to the Naugatuck River (Q_{plume}) was calculated conservatively using the area of the plume multiplied by an average hydraulic conductivity (K) of 56 feet per day, which was determined based upon the nature of the unconsolidated materials in the saturated zone and by the average horizontal hydraulic gradient, which was calculated using the groundwater contours from the August 2004 groundwater sampling event to be 0.004 feet/foot. The groundwater discharge from the plume to the rive was thus calculated to be 6.52×10^3 cubic feet/day based on the following calculation:

$$Q_{plume} = K * i * A$$

where:

Q_{plume} = groundwater discharge from the plume to the Naugatuck River

K = average hydraulic conductivity

i = average horizontal hydraulic gradient

A = area of plume

To calculate a dilution factor (DF) in accordance with the RSRs, a conservative value for 25% of the 7Q10 to the Naugatuck River was calculated to be 2.72×10^5 cubic feet/day. As described in the RSRs, a dilution factor was calculated using the following calculation:

$$DF = (25\% * 7Q10)/ Q_{plume}$$

where:

Q_{plume} = volume of plume discharging to the river = 6.52×10^3 cubic feet/day

25% * 7Q10 = 2.72×10^5 cubic feet/day

This calculation resulted in a dilution factor of 41.7, which is, again, a very conservative value for this Site, particularly because the value for the 7Q10 used in the calculation was developed for a location far upstream of the Site. The actual 7Q10 of the Naugatuck River in the vicinity of the Site would be far greater.

To calculate an alternative SWPC for the Site, the human health criterion for "organisms only" of 8.85 μg/l was multiplied by the calculated dilution factor of 41.7, resulting in a very conservative estimate for an alternative SWPC for PCE discharging from the Site of 369 μg/l. Consequently, the PCE concentration of 280 μg/l that was detected in groundwater from monitoring well MW-115 is less than the very conservatively calculated alternative SWPC of 369 μg/l. Based on this calculation, groundwater discharging from the Site does not pose a risk to human health via a surface water pathway. The human health criterion was used for the calculation of a alternative dilution factor because it is the criterion that was used n the calculation of the original SWPC and the water in the Naugatuck River in the vicinity of the Site would not be used for direct consumption.

Based on the DPH report, the physical survey, and the interview with Mr. Orciari of the DEP, there is one access point along the stretch of the Naugatuck River where the physical survey was completed, and that recreator fishing from the shoreline does occur along this stretch. However, PCE concentrations in MW-115 are below the calculated alternative SWPC. As such, exposure to surface water and ingestion of fish is not considered to pose a human health risk. No surface water samples have been collected from the Naugatuck River or Steele Brook as part of this investigation.

Sediment

Exposure to sediment can potentially occur near the MacDermid facility in the Naugatuck River. As with surface water exposures, sediment quality can potentially be impacted by groundwater discharge to surface water. In order to assess potential impact to sediment, groundwater samples were compared to the SWPC. Sediment quality may also have been impacted by a release of copper etchant in 1994 to MacDermid stormwater catchbasins that discharge to Steele Brook. As a result of this release, the *RCRA Corrective Action Stabilization Report* prepared by HRP states that approximately 30,000-gallons of water and copper etchant were removed from Steele Brook under the supervision of DEP. Following the removal of contaminated water from the Steele Brook, HRP collected eighteen sediment samples from Steele Brook and the Naugatuck River, including two upstream of the discharge in Steele Brook. The sediment samples were analyzed for copper, nickel, lead, and zinc. The results of the assessment indicate that concentrations of copper were generally highest at the point of discharge into Steele Brook with declining concentrations further downstream. Two exceptions were noted in the concentrations of nickel and zinc, which were reported at higher concentrations in background sediment samples collected upstream in the Naugatuck River versus at the point of the release. Although 1994 data suggests this medium may be contaminated, a complete exposure pathway is not present due to access limitations. Photographs along Steele Brook are included in Attachment 9 to document the overgrowth of vegetation and confirm accessibility limitations. No sediment samples were collected from the Naugatuck River or Steele Brook as part of the most recent investigations completed at the Site.

As discussed above, there is one access point along the stretch of the Naugatuck River where the physical survey was completed, and that recreator fishing from the shoreline does occur along this stretch. An alternative SWPC was calculated for PCE, whose concentration exceeded the SWPC in MW-115. As mentioned previously, a DF was calculated for groundwater discharging from the Site to the Naugatuck River. With the inclusion of the DF, concentrations of constituents in groundwater discharging to the Naugatuck River would be at such low levels as to not adversely impact sediment. No sediment samples have been collected from the Naugatuck River or Steele Brook as part of this investigation.

Subsurface Soil and Trench Air (Outdoor Air)

Subsurface soil and trench air are reasonably expected to be contaminated. Exposure to these media is controlled through an institutional control at the Huntingdon Avenue Facility. This institutional control is described in greater detain in response to Question 3.

Footnotes:

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately

protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

2 Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

Contaminated Media	Residents	On-Site Workers	Off-Site Workers	Trespassers	Recreation	Food[3]
Groundwater		YES	NO			NO
Air (indoors)	NO	NO	NO			
Surface Water					NO	NO
Sediment					NO	NO
Soil (surface)		NO	NO	NO		NO
Soil (subsurface e.g., >2 ft)		YES	NO			NO
Air (outdoors)		NO	NO			

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.
2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Groundwater

Groundwater beneath the Site may not be suitable for direct human consumption due to waste discharges, spills or leaks of chemicals or other land use impacts and has been assigned a classification of "GB" by the DEP. The "GB" groundwater classification includes the Site and surrounding areas within 1.0 mile to the south, east and west. The southern portion of the MacDermid NORTH parcel is also classified "GB". Based on information provided in the May 23, 2001 "*RCRA Corrective Action Stabilization Report*", and depth to groundwater data collected during August 2004, groundwater beneath the SOUTH parcel ranges between 29.80 and 36.90 feet below grade.

The results of the local well receptor survey have shown that there are no known active potable water supply wells in the immediate Site area that could be impacted by potential groundwater contamination emanating from the Site. The results of the survey are included as Attachment 8.

Because the Site is located in an industrialized urban area, there are no agricultural uses on the Site or in the immediate vicinity of the Site. As such, there is no potential for exposure of food sources to groundwater that flows beneath the Site.

Environmental Samplers were identified in the *Conceptual Site Model and Screening Levels* as having an exposure pathway for groundwater. As described under Question No. 2 above, there are identified exceedances of the screening criteria for this exposure receptor, media and pathway. The significance of these exceedances will be discussed in Question 4 below.

Environmental samplers were identified as being subject to an exposure pathway for LNAPL in groundwater. However, the implementation of an institutional control will limit these receptors' exposures to LNAPL in groundwater. The implementation of the Project Activity Analysis (PAA) process controls worker exposure to contaminants from various environmental media. The PAA process is primarily focused on the evaluation of potential human exposure to environmental contaminants in soil and groundwater. The PAA process will be used to control worker exposure to LNAPL in groundwater. Specifically, environmental sampling will be conducted by personnel who have received appropriate health and safety training, and applicable Personal Protection Equipment (PPE) will be worn.

Air (Indoor)

Volatilization of contaminants in groundwater is unlikely because depth to groundwater measurements indicate groundwater is approximately 30 feet below grade to 37 feet below grade as shown on Table 4 in the Technical Memorandum. The potential human pathway in this instance would involve volatilization of contaminants from impacted groundwater into the vadose zone, migration through the soil column into indoor air space and inhalation by the receptor. However, according to the EPA *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater to Soils*, exposure to volatile organic compounds from depths of 100 feet should be considered a potential pathway for air exposure.

Monitoring well MW-115 is located downgradient of one building structure at the Site (Drawing 1). As stated in the previous section, the VC are appropriately applied to groundwater at the Site at depths up to 30 feet below grade. Based on the locations of these wells and the EPA Guidance document, the potential for indoor air exposure from volatilization of these compounds in groundwater should be considered. However, MacDermid has substantially closed this facility and the building is vacant. Because operations have ceased and there is no intent to resume operations at this facility, the absence of workers at this facility eliminates a complete exposure pathway for indoor air, as long as the building remains vacant. In addition, contaminant concentrations in the most recent groundwater sampling event did not exceed the revised industrial/commercial VC. Also, the direction of groundwater flow to the southeast precludes contaminated groundwater at the Site from potentially impacting abutting residential properties located to the north and west of the Site, as discussed in Question 2.

Trench Air (Outdoor Air) and Subsurface Soil

Excavating Laborers (on-site workers) were identified as having an exposure pathway for outdoor air (trench air) and subsurface soil. However, the implementation of an institutional control will control these receptors' exposures to contaminants in groundwater, subsurface soil, and trench air (outdoor air encountered during performance of excavation of subsurface soil). The implementation of the Project Activity Analysis (PAA) process controls worker exposure to contaminants in subsurface soil, and trench air (outdoor air encountered in a trench during performance of an excavation). A PAA is completed prior to any activity that results in the excavation of soil (the potential source of exposure to constituents in groundwater, subsurface soil and air, due to soil movement). The PAA includes an assessment of available analytical data for soil and groundwater in the area where the proposed activity will occur. If no data are available, or if existing data are incomplete, samples are collected. The data for the areas are compared to the screening levels as discussed in this EID. If there are exceedances of applicable screening levels, all subsurface work in the area is conducted by personnel who have received appropriate health and safety training.

The purpose of the PAA process is to provide the basis for a consistent approach to ensure that potential worker exposures to various environmental media resulting from facility modifications are evaluated prior to the implementation of a modification. The PAA process is primarily focused on the evaluation of potential human exposure to environmental contaminants in soil and groundwater. Any facility modification that could result in a human exposure to soil or outdoor air (trench air) is subject to the PAA process. Typical facility modifications addressed by the PAA process include, but are not limited to:

- Onsite underground utility repair;
- Onsite landscaping (involving excavation to depths greater than 6-inches; routine maintenance would not be included);
- Onsite excavation outside of landscaped areas to any depth;
- Pavement replacement; and
- Removal of building structures including flooring.

For reference purposes, a guide process flow chart has been included at the end of this report as Attachment 10. The PAA process flow chart illustrates the decision steps of the process. However, MacDermid has substantially closed this facility and the building is vacant. Because operations have ceased and there is no intent to resume operations at this facility, the absence of workers at this facility eliminates a complete exposure pathway for indoor air, as long as the building remains vacant.

Because the Site is located in an industrialized area, there are no agricultural activities in the vicinity of the Site and potential exposure of food sources to contaminated soil or trench air is not considered a possible pathway. A summary of soil sampling and analytical information is included in Table 5. Table 6 provides a summary of the soil analytical results and Table 7 provides a summary of constituents detected in soil.. Tables 5 through 7 are provided under Attachment 11.

Surface Water

As discussed above, the Naugatuck River is located approximately 1,000 feet southeast of the Site and is the discharge point for groundwater flowing beneath the Site. The discharge point was determined by calculation of groundwater flow direction, evaluation of depth to groundwater, distance to the river and approximate 40 foot decrease in topographic relief from the Site to the Naugatuck River. Sections of Steele Brook that are not developed by industrial facilities are overgrown with vegetation preventing access to the brook, as shown in the photographs provided in Attachment 9. This surface water exposure pathway for this surface water body (Steele Brook) is considered incomplete.

The report entitled *Conceptual Site Model and Screening Level* prepared for the Site in May 2002 indicates that exposure to Site contaminants via ingestion of fish should be considered as a potential pathway because chemicals that bioaccumulate in fish could be transported by groundwater discharging from the Site. As discussed in further detail in Question 2 above, recreator fishing from the shoreline does occur along the stretch of the Naugatuck River where groundwater from the Site discharges, and such, is considered a complete pathway.

Sediment

Following the release of copper etchant to the Steel Brook in 1994, 30,000-gallons of water and copper etchant were removed from the brook under the supervision of DEP. Subsequently, eighteen sediment samples were collected and analyzed for copper, nickel, lead, and zinc. Concentrations of these metals were highest at the discharge point into the Steele Brook and generally decreased downstream toward the confluence with the Naugatuck River. The RSR do not include remediation standards for sediment. However, for the purposes of determining exposure risk for Off-Site Recreators, laboratory results from the 1994 sediment sampling were compared to the DEC. None of the constituents detected in the sediment samples collected from Steele Brook and Naugatuck River exceeded the residential DEC.

As discussed, groundwater flow direction trends in a southeasterly direction towards the Naugatuck River. As with the surface water pathway, potential impacts to Recreators from contact with sediment within the Naugatuck River are dependent on the quality of the groundwater that flows beneath the Site and discharges into this surface water body. A discussion of the accessibility of sediment at Steele Brook and the Naugatuck River is provided in the "Surface Water" section above. Based upon the results of the sediment sampling in 1994 and the inaccessibility of Steele Brook, exposure to sediment and exposure via ingestion of fishing in Steele Brook is not considered a complete pathway.

As with exposure to Recreators discussed above, exposure to sediment and exposure via ingestion of fish is considered an complete pathway at the Naugatuck River because there are accessible areas for recreational fishing downgradient of the Site.

3 Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

__X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

As discussed in Question 3 above, indoor air is not considered to have a complete pathway because the depth of groundwater at the Site is greater than 30 feet below grade and volatilization of contaminants is not considered significant. Although exposures to trench air (outdoor air) and subsurface soil are regulated by implementing an institutional control that determines the extent and concentration of contamination in an area of proposed activity and prevents unqualified personnel from working in these areas, MacDermid has substantially closed this facility and the building is vacant. Because operations have ceased and there is no intent to resume operations at this facility, the absence of workers at this facility eliminates a complete exposure pathway for indoor air, as long as the building remains vacant.

As discussed below, potential exposures to environmental samplers from groundwater beneath the Site can not reasonably be expected to be significant.

Groundwater

As discussed in Question No. 2, exceedances of the MCLs were identified in three monitoring wells (MW-103, MW-109, and MW-115) during the August 2004 groundwater sampling. Exceedances of the MCLs were identified in four groundwater samples collected during the July and September 2002 groundwater sampling events. Prior to 2002, exceedances of the MCLs were detected in two groundwater samples collected in 2001, in two of the same monitoring wells where exceedances were identified in 2002. Exceedances of the MCL were identified in 2002 for cadmium, chromium, nickel, 1,1-dichloroethylene, 1,2-dichloroethane, tetrachloroethylene, and trichloroethylene. The concentrations of these constituents only slightly exceed the MCL, with the exception of those (volatile organic compounds only) detected in the recently installed monitoring well MW-115 where the concentrations of VOCs are two to seven times greater than the MCL. In 2003, an exceedance of the MCL for cadmium was reported in well MW-109, and exceedances of the MCL for 1,1-dichloroethylene and tetrachloroethylene were reported in MW-115. In 2004, exceedances of the MCLs included chromium, nickel, 1,1-dichloroethylene (1,1,-DCE), 1,2-dichloroethane (1,2-DCA), tetrachloroethylene (PCE), and trichloroethylene (TCE) in monitoring well MW-115. PCE concentrations exceeded the MCLs in monitoring wells MW-105, MW-109, and MW-110. With the exception of monitoring well MW-115, no other downgradient monitoring wells of MW-105, MW-109, and MW-110 contained constituents at concentrations that exceeded the MCLs. Furthermore, LNAPL was documented in monitoring wells MW-108 and piezometer PZ-04.

Although the exposure pathway from groundwater, and LNAPL in groundwater, to Environmental Samplers is considered complete, exposure to contaminants in groundwater will be minimized through implementation of health and safety controls. Only personnel who have received appropriate health and safety training, who are familiar with available data and potential hazards associated with contact with groundwater at the Site, and who will wear appropriate PPE will conduct groundwater sampling at the Site, therefore exposures can not be reasonably expected to be significant.

Groundwater Discharging to Surface Water and Sediment

Based on the DPH report, the physical survey completed in August 2004, and the interview with Mr. Orciari of the DEP, there is one access point along the stretch of the Naugatuck River where the physical survey was completed, and that recreator fishing from the shoreline does occur along this stretch. However, PCE concentrations in MW-115 are below the calculated alternative SWPC. As such, surface water, sediment, and ingestion of fish are not considered to pose risk to human health although they are complete exposure pathways for human health risk exposure for the Naugatuck River. No surface water samples have been collected from the Naugatuck River or Steele Brook as part of this investigation.

Sediment quality may also have been impacted by a release of copper etchant in 1994 to MacDermid stormwater catchbasins that discharge to Steele Brook. As a result of this release, the *RCRA Corrective Action Stabilization Report* prepared by HRP states that approximately 30,000-gallons of water and copper etchant were removed from Steele Brook under the supervision of DEP. Following the removal of contaminated water from the Steele Brook, HRP collected eighteen sediment samples from Steele Brook and the Naugatuck River, including two upstream of the discharge in Steele Brook. The sediment samples were analyzed for copper, nickel, lead, and zinc. The results of the assessment indicate that concentrations of copper were generally highest at the point of discharge into Steele Brook with declining concentrations further downstream. Two exceptions were noted in the concentrations of nickel and zinc, which were reported at higher concentrations in background sediment samples collected upstream in the Naugatuck River versus at the point of the release. Although 1994 data suggests this media may be contaminated, a complete exposure pathway is not present due to access limitations. Photographs along Steele Brook are included in Attachment 9 to document the overgrowth of vegetation and confirm accessibility limitations. No sediment samples were collected from the Naugatuck River or Steele Brook as part of the most recent investigations completed at the Site.

4 If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a Site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the MacDermid Incorporated facility, EPA ID #**CTD001164599**, located at 526 Huntingdon Avenue, Waterbury, Connecticut under current and reasonably expected conditions.
This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Carolyn J. Casey Date 3/18/05
(print) CAROLYN J. CASEY
(title) ENVIRONMENTAL ENGINEER

Supervisor (signature) [signature] Date 3/22/2005
(print) JUAN A. PEREZ
(title) Acting Section Chief
(EPA Region or State) NEW ENGLAND - Region I

Locations where References may be found:
US EPA RCRA RECORDS CENTER

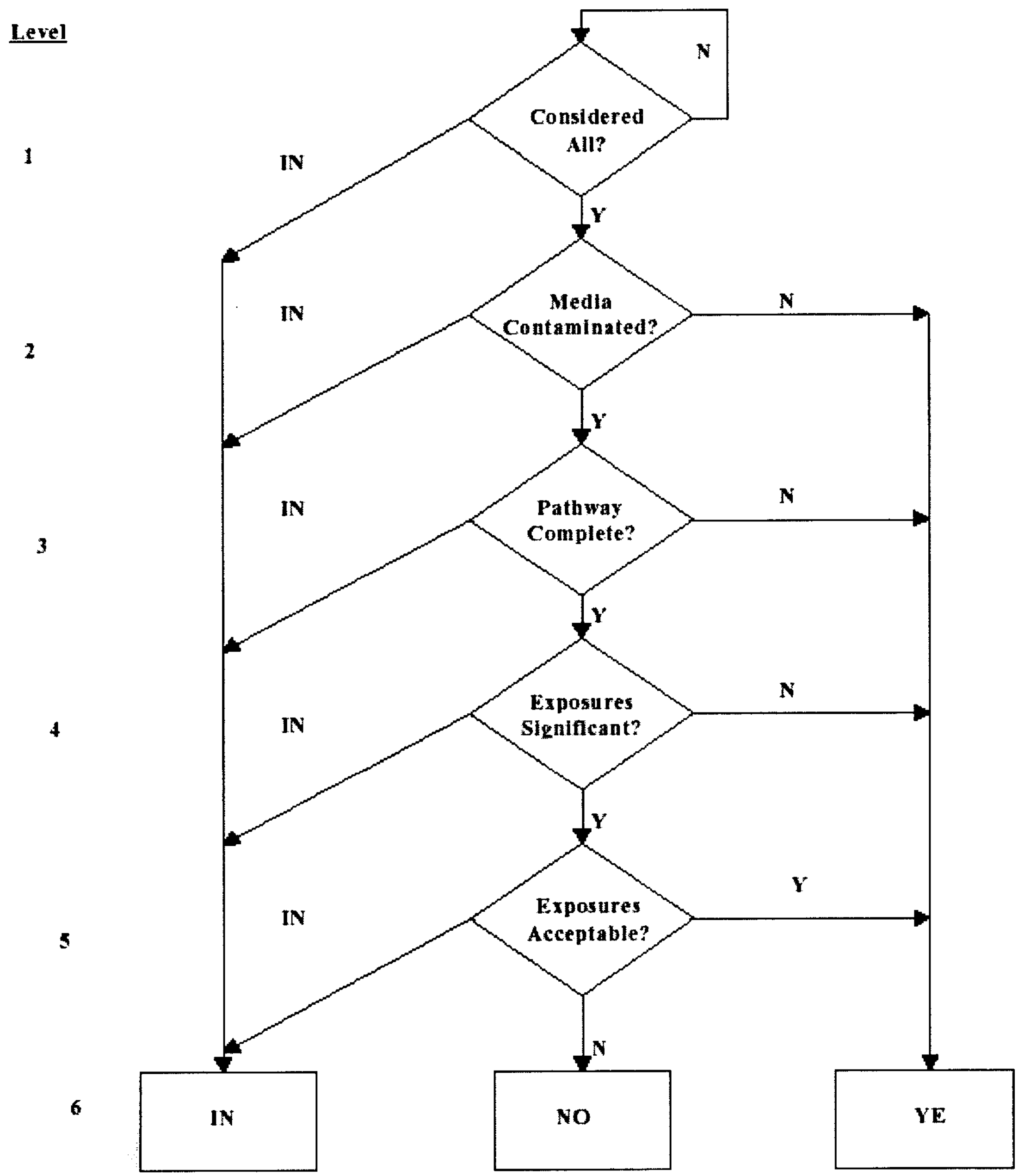
Contact telephone and e-mail numbers

(name) Mr. Richard Nave
(phone #) 203-575-5747
(e-mail) rnave@MacDermid.com

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE COPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Facility Name: ______________________________
EPA ID#: ______________________________
City/State: ______________________________

CURRENT HUMAN EXPOSURES UNDER CONTROL (CA 725)



US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 6033

Facility Name: MACDERMID INC

Facility ID#: CTD001164599

Phase Classification: R-13

Purpose of Target Sheet:

[ ] **Oversized** (in Site File) [ ] **Oversized** (in Map Drawer)

[ ] **Page(s) Missing** (Please Specify Below)

[x] **Potential FOIA Exempt** [ ] **Other** (Please Provide Purpose Below)

Attachments 1-12

Description of Oversized Material, if applicable:

____

[ ] **Map** [ ] **Photograph** [ ] **Other** (Please Specify Below)

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